there is the temptation to replace it. This sort of restoration, Dalibard maintains, is worse than vandalism and decay–it is intentional destruction of the original building fabric. Why produce fake historical buildings if one can preserve the real flavour of the original?

One of the problems encountered in restoration work is craftsmanship. How can a craftsman today, trained with modern materials and equipment, reproduce the work of a craftsman who received different training 100 or more years ago? If the contemporary craftsman uses identical materials, however, and is thoroughly familiar with his predecessor's tools, materials and techniques, he can achieve a high degree of authenticity.

He points out that the National Historic Sites Service represents the largest pool in Canada of skilled staff doing restoration and preservation work. As a result the Service is in the position to set the trend in restoration standards. The recently restored sales shop and furloft building at Lower Fort Garry National Historic Park (outside Winnipeg, Manitoba) is one of the best restorations in North America, Dalibard estimates. There have been a minimum of structural changes, and the character of the building, built in the 1840s as a Hudson's Bay Company store, has been preserved.

A course for training restoration and preservation specialists within the Department of Indian Affairs and Northern Development is now in the planning stages.

Precedent for such training is found in France where the schooling of restoration architects is largely handled by the "Service des Monuments historiques", the government agency responsible for conservation of historic monuments. However, the ultimate aim of the training course, concedes Dalibard, is to expand the student's perception and awareness. "All you can do is develop the sensibility of the student toward restoration-preservation. It's the sort of thing you can't really teach in a course."

Further, it takes a special awareness, what Dalibard calls "untraining", to reproduce a structure that looks and feels as if it were built before the power saw and pre-cast concrete brought uniformity to building construction.

He tells the story of how a craftsman was sent to Upper Canada Village, Ontario's museum-village restored to the mid-19th century period, for training in squaring logs with a broadax. He was shown how to follow the shape of the tree, but instead he returned to the job and proceeded to cut a perfect square out of the core of the log.

"We are used to seeing everything perfectly squared, perfectly smooth. It's not a matter of being skilled or unskilled, but that we have been brought up to see everything machine-tooled and perfectly finished. It takes a fantastic will and awareness to let yourself be natural–especially when you have all the means to make things square and smooth. In fact it takes a craftsman who can think."

Dalibard admits that some colleagues have labelled him a purist. But he maintains that a restoration job worth doing is worth doing well. "What I attempt to carry out is simply good design. Design that is compatible with the period, with the spirit of an age, that reflects a way of life."

"Candidates for the course would preferably hold university degrees, but this would not eliminate especially talented people who lacked them. Since restoration specialists are a diverse group–historians, architectural historians, archaeologists, landscape architects and engineers–the curriculum would be geared to the number and proportion of the different disciplines represented among the students. In format, the course will probably be given as a series of seminars conducted by experts (some on staff in the National Historic Sites Service), covering subjects such as repair of old stone buildings, repair of old wooden buildings, history of building technology, history of preservation and preservation legislation, and furniture and furnishings.

"The student apprentices would be given the opportunity to work in areas other than their chosen disciplines. For example, an architect could spend some time on an archaeological dig and in the artifact lab, prepare a historical report in the historical research section, select furniture with a curator, work in the design office or on construction in the field. In addition, the student would be given a chance to widen his knowledge through field trips to examine the work of other organizations on historic buildings and sites in Canada and the U.S."

1 The house of Etienne Verrier, the King's engineer in Louisbourg from 1724 to 1745, is being reconstructed as part of the fortress-town. The house foundations are original, the rest is being rebuilt using the same type of materials employed in the original: hand-cut sandstone blocks, hand-made nails and hinges, a special type of window glass, slate roofing, hand-finished woodwork, and the ever-present rubblestone. Verrier designed most of the fortifications and crown-owned buildings in the town, thus earning a royal grant to build one of the most comfortable dwellings in Louisbourg. In 1733 the building was finished for the modern equivalent of $60,000.

2 The old post office in Dawson City will be restored as part of Klondike Gold Rush International Historic Park. Jean Chrétien, Minister of Indian Affairs and Northern Development, outlined the departmental restoration philosophy when he said, "We could easily destroy the historical message of Dawson by too much zeal. I hope we can stop the deterioration of buildings and at the same time preserve the derelict quality that speaks so eloquently of the vanished ambitions of the gold rush Stampeders."

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Marking the Times

For years, the standard monument to commemorate Canada's national historic sites was a fieldstone cairn or simple cutstone marker bearing a rectangular bronze plaque. Recently however, the traditional tablet has been replaced by a modern aluminum plaque, and the National Historic Sites Service has erected a number of unusual monuments that call for more than a passing glance.

As a historical accent to centennial celebrations in the Northwest Territories last summer, Her Majesty Queen Elizabeth unveiled an imposing National Historic Sites Service monument at Fort Providence honouring explorer Alexander Mackenzie. The monument, a 25-ton, 6½ feet high boulder, took three months to find. Lifted by giant crane from the bed of the Mackenzie River, it had to be carted by flatcar over the 30-mile stretch to its present riverside site.

In Arnes, Manitoba, a sculpture by Walter Yarwood of Toronto commemorates Vilhjalmur Stefansson, eminent Canadian and internationally-renowned explorer-ethnologist. Located in the Icelandic community where Stefasson was born, the monument is composed of a three-foot high bronze figure and a ten-foot representation of the Inukshuk (a pile of rocks in man-like form constructed by the Eskimos as a landmark). The Inukshuk bears the inscription in Icelandic, English and French taken from Stefansson's autobiography, *Discovery*, "I know what I have experienced and I know what it has meant to me." The most important work that Stefansson undertook for Canada was as commander of the Canadian Arctic expedition, 1913-18, which completed mapping the outline of the Arctic Archipelago and made important contributions to zoological literature.

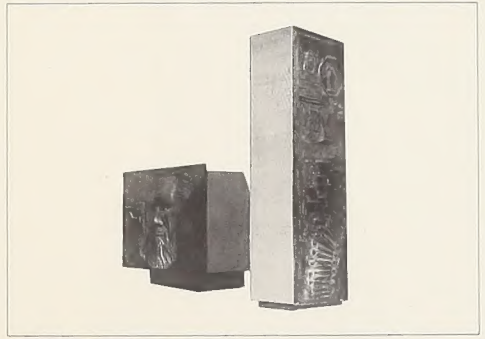
At Yellowknife, N.W.T., on a rocky hill overlooking Great Slave Lake, a 12-foot granite pylon honours the bush pilots who played a vital role in penetrating the isolation of the Canadian North. During the 1920s and 30s, the Canadian bush pilots not only opened present airlinks between the east, west, and far north, but also made aerial surveys, established new settlements, carried the mail and supplies to bush camps, and flew mercy missions.

The first bishop of Charlottetown, missionary priest Angus Bernard MacEachern, is commemorated by a granite monument at St. Andrew's, P.E.I. One of the outstanding figures in Prince Edward Island's history, Bishop MacEachern came to the province in 1790, and worked alone for almost 20 years ministering to the Catholic population of Nova Scotia, New Brunswick and Cape Breton Island.

In 1831, he established Prince Edward Island's first classical college at his own residence. Ben Johns of Halifax, a landscape architect on the engineering staff of the National and Historic Parks Branch, designed the monument as a larger-than-life abstract of the clergyman. He explains, "My initial thoughts for the monument were that it should communicate the qualities of accomplishment and strength which were quite evident in Bishop MacEachern. Granite in a rough-textured finish was selected as the material to best represent the qualities of ruggedness and strength. The granite figure for mounting the commemorative plaque is intended as an abstract form of the cross and a robed clergyman."

At Sarnia, Ontario, two massive bronze-faced monoliths designed by Walter Yarwood honour Alexander Mackenzie, second prime minister of Canada. When the Pacific railway scandal caused the downfall of Sir John A. Macdonald's government, Mackenzie was called upon to form the first Liberal administration of the Dominion. As both prime minister and minister of public works from 1873 to 1878, he dedicated himself to consolidating the newly-formed Dominion, and though reputedly strict and colourless, he was a prodigious worker who literally wore himself out in the service of his country and party.

In St-Jean-Port-Joli, Québec, long a center of traditional Québec art and handicrafts, an artist is carving a life-size statue of Sir Étienne-Pascal Taché, one of the Fathers of Confederation. The figure, commissioned by the National Historic Sites Service, is to be carved of grey granite, and will stand five feet ten inches tall on a six-foot granite plinth. It is being executed by Jean-Julien Bourgault in the traditional style of miniature wooden figurines carved by the Bourgault family for two generations. When completed later this year, the statue will be erected in Montmagny, the Québec community where Taché was born and practised medicine.



Alexander Mackenzie's sculpted head emerges from a background symbolizing his contributions to Canada's development through his careers as stone mason, building contractor, federal minister of public works, and editor of the Lambton Shield, a Reform newspaper that crusaded on behalf of radical Liberals. The monument is flanked by a monolith representing his business and political associations with the City of Sarnia.

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Boats on Wings

Sitting low in the water it looked like an oversized cigar with two top-mounted motors. But once it picked up speed, the craft lifted itself on blade-like foils and shot across the tops of the waves like a jet plane in flight. The hydrofoil HD-4 raced across the Bras d'Or Lakes in Nova Scotia not once but 85 times until on September 9, 1919 it reached a speed of 62 knots, just over 70 miles per hour. No boat had ever travelled faster. In fact on that trip, the HD-4 set a speed record for hydrofoils that was to last for 50 years. In 1969, the HD-4 speed record was broken by another Canadian ship, the Canadian Armed Forces' experimental hydrofoil *Bras d'Or*, which outraced the historic hydrofoil by only two miles per hour. And this in an era of jet propulsion and manned flights to the moon.

The HD-4 was the fourth in a series of hydrodromes or surface-skimming vessels developed by Alexander Graham Bell and his engineering associate F. W. Baldwin at Baddeck. Bell's and Baldwin's aim was to build a boat that could transport loads with the speed of contemporary aircraft. They also believed the hydrofoil would prove an effective submarine chaser because of the speed with which it could make approaches and getaways, and because the hull was raised above torpedo range.

The hydrofoil's design resulted from Bell's interest in kites and aircraft, and his experiments in launching them from the water. By attaching catamaran floats to his large kites and substituting an engine and propeller for the kite line, he groped toward the boat-plane principle. To counteract the adhesion between the aircraft's floats and the water, he and Baldwin began their experiments with hydrofoils.

To overcome the water's resistance a ladder of foils was attached to outriggers on each side of the craft's hull, with a third set as a rudder at the aft end, and a "preventer" set at the bow to prevent nose-diving during takeoff. As it gained speed, the boat would rise on its hydrofoils, much like a water skier rising out of the water, until it rested on the smallest tier of foils at the bottom, lifting the entire hull above water.

Although Bell's and Baldwin's attempts to interest Canadian, British, and United States governments in further developing the craft ultimately petered out, comments on the HD-4 were favourable. The U.S. Navy Department expressed the official view that "at high speed in rough water the boat is superior to any type of high speed motor boat or sea sled known. The general impression obtained by riding in this boat

Two 1912 models from which the HD-4 evolved are examined by Bell and his modelmaker Hector P. McNeil. *Bell photographs courtesy and copyright The Bell Family and National Geographic Society.*

is one of stability, sea-worthiness and ability within the limits of the design."

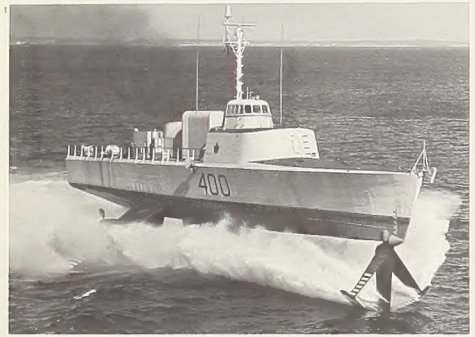
The active career of the HD-4 came to a rather inglorious end with a series of towing tests carried out at Bell's request. Stripped of her engines, the hydrofoil proved a successful naval towing target, but the Canadian navy neglected to follow the possibility through and the craft was left to crumble on the shore at Baddeck. For 40 years the remains of the hydrofoil's 60-foot wooden hull lay abandoned until acquired from the Bell family by the National Historic Sites Service in the late 1950s and placed in a storage shelter near the Alexander Graham Bell Museum. But before plans for restoration work could be attempted, a detailed record of the hull had to be taken. Last summer, after 10 years of preliminary research, the engineering drawings on which restoration would be based were completed.

Paul Stumes, restoration engineer, indicating the immensity of the task, says it took several hundred hours' work to measure and record less than one quarter of the hull. The technical drawings had to be complete down to the last bolt and piece of rotted wood; accurate to the tenth of an inch. Before replacing or strengthening rotted parts of the craft, the engineers will also study the technical notes made by Baldwin as he continued experiments with the hydrofoil after Bell's death.

Frank Harley, the restoration naval architect who oversees the restoration and maintenance of all vessels displayed in the National Historic Parks system, tested hydrofoils for the Royal Canadian Navy before he came to the Department of Indian Affairs and Northern Development. Harley explains the functions of the modern descendant of Bell's HD-4. "The hydrofoil boat operates most efficiently at high speed on its foils, or at low speeds floating on its hull with foils completely submerged. It is a rough weather craft, but it can't carry great loads of men, gear or cargo, so it's really of restricted commercial value. Over a short distance, the 15-ton *Bras d'Or* could carry the equivalent of 250 men, but on long runs, say 2,000 miles, the weight must be replaced by fuel. Actually, the development of transistorized radio equipment and the replacement of guns with modern rockets has increased the usefulness of the craft from the military point of view. Bell's HD-4 had a very limited carrying capability because of the limited power of the motors."

The HD series of hydrofoil vessels were not the first of this type of craft. An Italian, Forlanini, pioneered the hydrofoil principle in 1906. In 1907 the Wright brothers used hydrofoils as they attempted to water-launch their aircraft from floats. In 1914, they attached hydrofoils to their Type K seaplane and sold it to the U.S. Navy. Between 1919 and 1950, however, the hydrofoil was relegated to the drawing boards. During the Second World War Baldwin built a new series of vessels to aid allied troops in the invasion of Normandy, but they were never used. In the early 1950s the Canadian Navy resumed research on the craft at the instigation of Lt. Cmdr. Duncan M. Hodgson, who was a friend of Baldwin's.

Russians, Americans and Germans have also experimented with the hydrofoil as a passenger vessel, each evolving craft that operate on separate principles. Yet the Bell-Baldwin HD-4 was the most highly-developed hydrofoil vessel for some years. Comments Harley, "With the state of technological development and the material available at the time, Bell's and Baldwin's hydrofoil was brilliantly built. It was 30 years before anyone got anything as good again."



1 The Canadian Armed Forces' $52 million hydrofoil ship *Bras d'Or* rides above the waves during recent trials off Halifax, N.S.

2 An archival photograph shows the original HD-4 carrying a crew of four in a trial run in the Bras d'Or Lakes region of Nova Scotia. The engines are mounted above the deck, behind the cockpit. The remarkable craft was launched on October 10, 1918 and underwent 85 extensive trial runs until January 4, 1919. Lightly constructed, it was designed to serve as a basis for an improved craft. Survival of the hull after 40 years' exposure to the elements is indicative of the design's soundness.

Preserving our Historic Buildings

"This window frame is over 100 years old," Paul Stumes commented as he bounced the glassless eight-paned antique on the linoleum floor of his office. Stumes, a restoration engineer with the technical services branch of the Department of Indian Affairs and Northern Development, pointed out that an ordinary old wood frame would probably break at the joints after such treatment. This frame had been injected with epoxy resin, making it stronger than when it was constructed a century ago. Yet it still had the appearance and feel of old wood.

Salvaging wood from decay is one of the myriad tasks that preservation of historic structures entails. The National Historic Parks system encompasses 30 developed historic site is being made available to the public quickly and economically.

In the case of a standing building, stabilization may mean leaving doors, windows or stairs intact while replacing floor joists and rafters which have rotted because of neglect.

Many of the old wooden buildings in Dawson City, abandoned by the gold rushers of '98 scarcely a decade after they had been built, have suffered more from vandalism and neglect than from the severe changes of climate. Where permafrost has melted, buildings sink and lurch. Dawson's old post office building, to serve as visitor information centre in the planned Klondike Gold Rush International Historic Park, has settled into the ground with its centre a full foot higher than its sides. Other old buildings are on the verge of collapse. Here, a combination of stabilization and "restoration", the most difficult type of preservation, will be undertaken.

Before actual restoration work begins, all architectural and archaeological evidence must be recorded with extremely detailed drawings and photographs. Since the buildings will ultimately have to stand up under their own weight as well as carry the additional load of visitors crowding through, load-bearing tests must be carried out and even local soil and climatic conditions noted.

At Louisbourg National Historic Park in Nova Scotia, a combination of concepts has been applied. Since the original French fortress-town was systematically demolished by the British in 1760, all buildings are reconstructions from the ground up. Some foundations have survived well enough to be stabilized and incorporated into complete structures. Other features, like lime-kilns and brick-vaulted cellars, are stabilized as ruins and will remain as such. Features that have deteriorated too far to be successfully stabilized or incorporated in the rebuilding are entirely reconstructed. Between one-fifth and one-quarter of the harbour town and its fortifications will be rebuilt, furnished, and populated with costumed townspeople, tradesmen, and soldiers to reflect the 1740s before French fortunes in North America declined. The remainder of the town will be left in ruins as a contrast to Louisbourg as it flourished.

A new preservation concept will be introduced by the Department at Grand Pré, N.S. There what is believed to be a 200-year-old Acadian building will be treated as an archaeological artifact; no restoration work beyond a minimum of stabilization will be carried out. The one-storey structure, measuring about 17 by 23 feet, at one time served as a combined dwelling and poultry loft. Now most of the shingled exterior is exposed, revealing the planking and birchbark chinking that forms the structure's anatomy. Interestingly enough, birchbark chinking (instead of mud or mortar), is still used in the construction of wooden buildings in some rural areas east of Québec City. The structure has been moved from its site near Windsor, N.S. for display in a shelter near the old Blacksmith's Shop at Grand Pré.

The Acadians were mainly descendants of colonists brought to Nova Scotia from the western regions of France between 1632 and 1651. Before they were dispersed by the English in 1755, they settled and farmed in the present provinces of Nova Scotia, New Brunswick, Prince Edward Island, parts of Québec and the State of Maine. Although the Nova Scotia Acadians alone numbered 10,000 in 1755, little material remains of the colony have survived to the present. The Acadian dwelling will provide a rare glimpse into the past.

One of the earliest (1731) views of Louisbourg is this scene from the harbour, signed by *Verrier Fils*, son of the chief engineer. Verrier did not confine himself to a factual account of what existed in 1731, but added features like the quay wall and Chateau tower (right, center) that his father hoped to build in future years. The modern reconstruction, to be completed by 1976, simulates Louisbourg in 1745.

sites (with another 21 under development), spanning some 5,600 miles from Dawson City to St. John's and four centuries in history. The structures that fall under the Historic Parks umbrella vary in size and materials, ranging from turn-of-the-century sternwheelers to 200-year-old fortifications. Some have been especially vulnerable to the ravages of nature and man. As a result, "preservation" involves a gamut of techniques from "mothballing", the most basic and least costly, to "restoration", the most complex and expensive.

Mothballing involves carrying out the minimum amount of repair to a structure to stop further deterioration. It may mean waterproofing, propping up walls, cleaning and spraying wood surfaces with insecticide. This method of preservation retains the structure for future archaeological investigation and restoration but excludes visits by the public.

"Stabilization" is a preservation method that may consist of solidifying masonary ruins with mortar to prevent frost action and further deterioration, or replacing the decaying parts of wooden structures. Fort Beauséjour, N.B., was built by the French in the mid-18th century and fell into ruins after it served the British in the War of 1812. An extensive program of stabilization of the ruins is underway, and thus an interesting

The Restoration Architect

For Jacques Dalibard, old buildings are as expressive as fine sculpture. As chief restoration architect with the technical services branch, Department of Indian Affairs and Northern Development, he believes the old and historic buildings constitute the richest part of our urban fabric.

Dalibard's work for the National Historic Sites Service takes him from the Yukon to Newfoundland – covering some 100,000 miles a year – and he finds a growing public interest in preserving our building heritage. This is partly reflected in the increased number of cost-sharing agreements between the federal government and provinces, municipalities, and private agencies for restoration of architecturally or historically important buildings. (Structures restored under cost-sharing plans range from a pre-Confederation apothecary in Niagara-on-the-Lake, Ontario, to the Emily Carr House in Victoria, B.C. To date, 16 of these co-operative agreements have been undertaken.)

Yet at the same time, maintains Dalibard, there is a lack of awareness among North American architects of the need for specialized training in restoration. As one of the few professional restoration architects in Canada he decries the lack of training facilities. Now in his mid-30s, Dalibard received his undergraduate training in history in his native France, studied architecture at McGill University and restoration architecture at Columbia University in New York.

"When I did my graduate studies at Columbia, there were a number of other architects studying with me who didn't originally intend to be restoration specialists, but simply wanted to practise architecture in historic cities like New Orleans, Savannah, Charleston or Boston. Here we have a similar situation when architects practise in historic areas like Québec City. An architect with general training working in a historic district should have a background in restoration. For he could conceivably put up a new structure that would destroy the character of the historic area."

Except for Québec province, where areas that have been declared "historic districts" are protected by a Historic Monuments Act, there is no legislation to control construction or the quality of restoration work in historic areas. In other provinces, each municipality exercises control through its zoning laws and the issuing of building permits.

The restoration architect must be both generalist and specialist. In Canada, for example, he must be versed in social history and acquainted with the broad range of building techniques employed here over the past 400 years. As a specialist he must be knowledgeable about the particular building techniques carried to specific regions in Canada by immigrant European tradesmen, and about the original tools and materials that were used.

Successful restoration involves more than expert application of engineering and technological skills. In any work demanding skill, time, and expense, there is a tendency to take shortcuts, but in restoration work shortcuts can destroy the historic integrity of a structure. Instead of preserving a rotting window frame with epoxy, for example,